BOOK REVIEWS.

EDITED BY W. H. BUSSEY, University of Minnesota.

Plane Analytic Geometry. By MAXIME BÔCHER. Henry Holt and Company, New York, 1915. xiii + 235 pages. $1.60.

In reading this book the first thing to impress one is the pleasing style. Everything is so simply and clearly, yet at the same time so accurately stated, that the average student should be able to read the text by himself and understand even the finer points. It is exactly the sort of book that those who have been fortunate enough to hear Professor Bôcher's lectures might have expected him to write. To give an example of this accuracy of statement, in deriving the equation of a locus, the author points out very clearly that all we have shown is that the moving point must satisfy the derived equation, and hence that the required locus may form only a part of what we have found. Again, he is at some pains to show that for the ellipse, when we rationalize the equation $FP + F'P = 2a$, the resulting equation is really equivalent to the original one—something the reviewer remembers seeing in no other text. Then, too, in deriving the equations of a straight line, care is taken to show, not merely that any point on the line satisfies the equation, but also the converse. Something, again, that is not done in every text.

In the introduction it is stated that "the one aim should be to put the student into possession of an instrument which he can himself use in proving new geometrical theorems or solving new problems." As a result of the observance of this principle, many will feel that there are too many theorems to be proved analytically and not enough drill problems. Whether this feeling is justified or not depends, of course, on the class and the instructor.

Here, as well as in the author's *Trigonometry*, a great deal of matter has been put in fine print to be omitted by the average class. The principal topic so relegated, besides oblique coördinates, is the normal form of the equation of a straight line. The distance from a point to a line is found by a direct method, and the question of the sign of this distance is treated later in fine print. Many will doubtless disagree with this procedure, but it has much to recommend it. The usual treatment of this distance seems a very roundabout and artificial one to students and usually presents difficulty; in fact the normal form often seems to them a most abnormal one. Omitting it tends to make the work seem more direct. On the other hand, the normal form is the only one to which the equation of *any line whatever* may be reduced, and it is almost indispensable in any work using abridged notation. This does not form an argument, however, for its being studied in a first course; and the reviewer is in hearty agreement with the arrangement in the text.

At the end of the book are two chapters on the differential calculus—not "hashed fine," as the author says in the introduction, "but put squarely as a new subject," covering a surprisingly large amount of the subject with unusua, clearness. While these chapters are very carefully written and form an excellent

introduction to the calculus, there is plenty of material in the rest of the book for those who prefer not to take up the calculus at this time.

Many who teach analytic geometry to students of whom it is required, will think the book too difficult, but others will find it well adapted to their needs. In any case, it is a book to be considered in choosing a text, and presents a distinct advance over the usual textbook.

The general appearance and typography of the book are excellent.

It should be added that Professor Bôcher has written a syllabus for a course in solid analytic geometry following the same lines as this book.

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PROBLEMS AND SOLUTIONS.

EDITED BY B. F. FINKEL AND R. P. BAKER.

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PROBLEMS FOR SOLUTION.

ALGEBRA.

448. Proposed by W. D. CAIRNS, Oberlin College.

In the *Washington* (D. C.) *Times*, Mr. W. A. Dayton called attention some weeks ago to a curious repetition of digits in the decimal value of 1/115. If this decimal, which we print in the form $0.\dot{8}6956521739130\ 4347826\dot{0}$ be divided by two, the result is $0.\dot{4}3478260\ 8695652173913\dot{0}$, the fourteen-digit and eight-digit groups having been thus interchanged. A similar result, as he points out, is obtained if the original decimal value is divided by four. Mr. Dayton asks that this curiosity be explained.

449. Proposed by FRANK IRWIN, University of California.

Sum the expression

$$1 + 2\binom{k+1}{k} + 3\binom{k+2}{k} + \cdots + (n-k+1)\binom{n}{k}.$$

Also show how to sum

$$1\cdot 2 + 2\cdot 3\binom{k+1}{k} + 3\cdot 4\binom{k+2}{k} + \cdots + (n-k+1)(n-k+2)\binom{n}{k},$$

$$1\cdot 2\cdot 3 + 2\cdot 3\cdot 4\binom{k+1}{k} + 3\cdot 4\cdot 5\binom{k+2}{k} + \cdots + (n-k+1)(n-k+2)(n-k+3)\binom{n}{k},$$

etc., where $\binom{l}{k}$ is used to denote the coefficient of x^k in $(1+x)^l$.

GEOMETRY.

479. Proposed by NATHAN ALTSHILLER, University of Colorado.

Find the locus of the point whose polars (polar planes) with respect to two given conics (quadrics), are perpendicular to each other.

480. Proposed by CLIFFORD N. MILLS, Brookings, S. Dak.

Of equal quadrilaterals on the same base, that which has the least perimeter must have the angles not adjacent to the base equal to each other.